Cumulative Index 1989

Volume 18

March	HYPOGLYCEMIA, pages 1–252
June	MEDICAL THERAPY OF ENDOCRINE TUMORS, pages 259–592
September	HYPERCALCEMIA, pages 601–829
December	METABOLIC BONE DISEASE, PART I, pages 833–1012

Note: Page numbers of article titles are in **boldface** type.

Abdominal pheochromocytoma, 465–466
Acquired immunodeficiency syndrome (AIDS), and hypercalcemia, 775
Acromegaly, **277–310**
  biochemical "cure," 287
  bone scanning, 985–987
  clinical picture, 281–283
    extrapituitary hypersecretion, 283
    GH/IGF-I excess, 281–282
      cardiovascular system, 282
      external appearance, 281
      metabolic changes, 282
      musculoskeletal changes, 281
      peripheral neuropathy, 281–282
    mass effects of pituitary tumor, 282
    pituitary, hormone deficiency, 282–283
      hypersecretion, 283
  differential diagnosis, 285
  dopamine agonists, 291–295
    administration, 294
    bromocriptine, 291
      GH responses, 293
      objective estimates of clinical efficacy, 293
      symptomatic improvement, 293–294
    GH suppression, 291–293
    indications for, 294
    predictors of response, 294
    shrinkage of GH-producing tumors, 294
  from ectopic GHRH secretion, 302–303
  epidemiology, 279–280
  histomorphometric analysis, 945
  laboratory diagnosis, 283–285
    dynamic tests of GH secretion, dopamine agonists, 285
      thyrotropin-releasing hormone, 285
      glucose suppression, 284
    ectopic GHRH secretion, 285
    GH plasma levels, 283–284
    IGF-I plasma levels, 284
    radiologic diagnosis, 285
  natural course, 285–286
  pathogenesis, 277–279
    GH hypersecretion by ectopic pituitary tumors, 278–279
    growth factor overproduction, 279
    growth hormone–releasing hormone secretion, 278
    pituitary GH-producing tumors, 277–278
  pathophysiology, 280–281
  pharmacologic treatment, 290–291
  radiation therapy, 289–290
  somatostatin, 295–303
    chronic treatment, 296–297
    clinical response, 299
    continuous infusion, 301
    dynamic GH response, 299
    GH suppression, 298–299
    other endocrine functions, 299–300
    pharmacology, 296
    pituitary tumor size, 300–301

Acromegaly, *(Continued)*
side effects, 301–032
unresponsiveness to, 301
surgical treatment, 287–289
treatment, 286–287
ACTH, and aldosterone secretion, 416–417
deficiency, 148–149
in infants and children, 227
ectopic Cushing's syndrome, 313–315, 331
See also *Cushing's syndrome.*
ACTH-independent Cushing's syndrome, 315–316, 331–332
Activation frequency, 930–931
Addison's disease, and hypercalcemia, 400, 771
and hypoglycemia, 149–150
Adenoma, aldosterone-producing, and low-renin aldosteronism, 419–420, 428–433
Adrenal, in Cushing's syndrome, anatomy of lesions, 320–321
surgery, 323–324
primary hyperplasia, 420
Adriamycin, for insulinoma, 71
for malignant insulinoma, 494
Adult patients, familial benign (hypocalciuric) hypercalcemia, 726–727
Aging, and physiological processes in bone, 939–940
Alcohol-induced hypoglycemia, **84–87**
mechanisms, 86–87
Aldosterone. See *Aldosteronism, low-renin.*
Aldosteronism, low-renin, **415–422**
clinical presentation and diagnosis, 422–426
adrenal venous sampling, 425
biochemical diagnosis, 422–424
clinical presentation, 422
computer imaging studies, 424–425
hormonal studies, 424
scintigraphy, adrenal iodocholesterol, 425
medical treatment, 426–433
of aldosterone-producing adenoma, 428
of aldosterone-producing adrenocortical carcinoma, 427–428
of glucocorticoid suppressible aldosteronism, 426–427
of idiopathic bilateral aldosteronism, 428–433
pathophysiology, 419–422
glucocorticoid-suppressible aldosteronism, 420–421
idiopathic aldosteronism, 421–422
subtypes of primary aldosteronism, 419–420
aldosterone-producing adenoma, 419–420
aldosterone-producing carcinoma, 420
primary adrenal hyperplasia, 420
physiology of aldosterone secretion, 415–419
inhibitors, 418–419
atrial natriuretic hormone, 419
dopamine, 418–419
somatostatin, 419
stimulators, 416–418
ACTH, 416–417
pituitary factor, 417–418
potassium, 417
renin-angiotensin system, 416
serotonin, 418
Alkaline phosphatase, in bone development, 871–873
in hypercalcemia, 769
Amino acid metabolism, in infants and children, 233–234
Aminoglutethimide, 325–326
Anatomy, of adrenal glands, 444
of Cushing's syndrome, 319–321
adrenal lesions, 320–321
pituitary lesions, 319–320
of parathyroid gland, 661–663
in familial benign (hypocalciuric) hypercalcemia, 728–731
Androgens, and prostate cancer, 580–583
Anesthesia, and pheochromocytoma surgery, 460–461
inhalation, 462–463
regional, 464–465
Angiography for Zollinger-Ellison syndrome, 529
Anisotropy of bone, 937
Anorexia nervosa, bone mass and density measurement, 1010
Antiarrhythmic drugs, and pheochromocytoma, 459, 463
Antibodies. See *Autoimmunity syndromes, and hypoglycemia.*
Anticholinergic agents, in Zollinger-Ellison syndrome, 524
Antiestrogens, for breast cancer, 572–575
Aromatase inhibitors, for breast cancer, 575–577
Arteriography, of insulinoma, 64–65
parathyroid localization, 688–689
Arthritis, rheumatoid, bone mass and density, 1008–1009
Artifactual hypoglycemia. See *Hypoglycemia, artifactual.*
Asparaginase, 71
for malignant insulinoma, 494
Atrial natriuretic factor, and aldosterone secretion, 419
Autoimmunity syndromes, and hypoglycemia, **123–143**
antireceptor antibodies, 123–132
clinical aspects, 124
laboratory studies, 124–127
pathophysiology, 127–130

therapy, 130–132
autoimmune insulin syndrome, 132–139
clinical aspects, 133–134
etiology, 136–139
laboratory studies, 134–136
pathophysiology, 136
therapy, 139

Benzothiadiazine, natriuretic, 491
in insulinoma, 68
Beta-adrenergic blocking agents, and uremic hypoglycemia, 112–113
Beta-sympathomimetic drugs, 175–176
Biglycan, 876–880
Bioassays, of parathyroid hormone, 615–616
Biochemistry of bone, **859–902**
mineralized bone matrix, 859–886
adsorbed constituents from serum, 885–886
osteoblast-synthesized components, 860–884
bone sialoprotein, 882–883
collagen, 860–867
glycoproteins, 869–876
proteins containing gamma-carboxyglutamic acid, 867–869
proteoglycans, 876–880
sialoproteins and phosphoproteins, 880–882
osteoclast-synthesized components, 885
organic phase and biologically controlled mineralizaton, 886–888
Bisphosphonates, and hypercalcemia, 406–407, 815–818
Blood, collection and storage, 203–204
peripheral, hypoglycemic changes, 31
whole vs. plasma or serum values, 205–206
Bone, biochemistry, **859–902**
cell physiology, **833–858**
bone formation and resorption, 834–835
coupling of bone formation and resorption, 847–849
hormones and local factors in bone resorption, 835–838
resorbing agents, 836–837
inhibitors of resorption, 838
humoral and local factors, 838–846
osteoblasts, 838–842
osteoclasts, 842–846
histomorphometric analysis, **919–954**
mineral density, in familial benign (hypocalciuric) hypercalcemia, 733
physiology, **833–858**
resorption, and hypercalcemia, 406–408
scan, of pheochromocytoma, 456
Bone acidic glycoprotein (BAG-75), 883
Bone balance calculation, 930
Bone disease, in hyperparathyroidism, 638–640
Bone mass and density measurements, **995–1012**
clinically useful techniques, 995–1001
areal density and bone mass in spine, hip, and total body, 998–999
density in appendicular skeleton, 995–998
mineral measurements, 1004–1010
anorexia nervosa, 1010
corticosteroid-induced osteopenia, 1008
hyperparathyroidism, 1009
hyperthyroidism, 1010
in metabolic bone disorders, 1008
renal osteodystrophy, 1009–1010
rheumatoid arthritis, 1008–1009
quantitative computed tomography, 999–1001
repeated measurement of bone loss, 1001–1004
radiation burden, 1004
Bone matrix, biochemistry of, 859–886
organic phase and biologically controlled mineralization, 886–888
osteoblast-synthesized components, 860–884
bone sialoprotein, 882–883
collagen, 860–867
glycoproteins, 869–876
growth factors, 883
morphogenetic proteins, 883–884
proteins containing gamma-carboxyglutamic acid, 867–869
proteoglycans, 876–880
sialoproteins and phosphoproteins, 880–882
osteoclast-synthesized components, 885
serum constituents, adsorption of, 885–886
Bone scanning in metabolic bone disease, **979–993**
acromegaly, 985–987
diabetes, 987
hypercalcemia, 769
hypercortisolism, 987
hyperparathyroidism, 979–980
hypervitaminosis A, 985
osteomalacia, 984–985
Paget's disease, 987–991
quantitation, 991
renal disease, 980–984
thyroid disease, 985
whole body retention measurements, 991
Branched chain α-ketoacid dehydrogenase, 233–234
Breast cancer, **568–579**
antiestrogens, 572–575
aromatase inhibitors, 575–577

Breast cancer *(Continued)*
estrogen priming and chemotherapy, 577–578
luteinizing hormone–releasing hormone superagonists, 571
patient selection for endocrine treatment, 568–569
progestins, high-dose, 577
somatostatin analogue therapy, 578–579
traditional hormonal therapy, 569–570
Bromocriptine, in acromegaly, 291–294
analogs, in hyperprolactinemia, 265
and radiation therapy, 269
and surgery, 268–269
in Cushing's syndrome, 325

Calcitonin, and hypercalcemia, 407, 814
Calcitriol, in hyperparathyroidism, 653
Calcium, channel blockers, for hyperinsulinism, 491
for insulinomas, 68
in low-renin aldosteronism, 431–432
gastrointestinal absorption, and hypercalcemia, 408
homeostasis, 389
in hypercalcemia, 768
intake, 821
24-hour urine levels, 769
infusion test, 39–40
regulation in humans, **601–610**
calcium fluxes, 603–605
regulation of, 605–606
feedback loop diagram, 606–608
analysis of, 609
expansion of, 609
stability of serum values, 601–603
urinary, in familial benign (hypocalciuric) hypercalcemia, 726
Caloric intake, and hypoglycemia, 158–160
Carbohydrate metabolism, in infants and children. See *Infants and children, hypoglycemia in.*
response to hypoglycemia, **1–25**
counterregulation, during acute hypoglycemia, 13–17
during chronic hypoglycemia, 17–18
gluconeogenesis, 4–7
glucose utilization, 1–2
glycogenolysis, 3–4
hepatic glucose metabolism, 2–3
hormonal control of glucose homeostasis, 7–13
corticosteroids, 10–11
epinephrine and norepinephrine, 9–10
glucagon, 9
growth hormone, 11–13
insulin, 7–8
recovery from hypoglycemia, 13
See also *Exercise and carbohydrate storage and intake.*
Carcinoid syndrome, malignant, **555–566**
carcinoid crisis, 563–565
chemotherapy trials, 559–563
hepatic arterial ligation or occlusion, 561
hepatic artery devascularization with chemotherapy, 561
somatostatin analogue therapy, 561–563
clinical features, 555–556
pathophysiology and diagnosis, 556–557
therapeutic considerations, 557–559
Carcinoma, aldosterone-producing, and low-renin aldosteronism, 420, 427–428
papillary or papillary-follicular. See *Thyroid tumors.*
parathyroid, 692
Cardiovascular system, in acromegaly, 282
and pheochromocytoma, 468
Carmustine, 494
Catecholamines, and pheochromocytoma, 445–447
pharmacology of drugs affecting actions of, 447–450
Catheterization, venous, parathyroid localization, 689–692
Cervical pheochromocytoma, 467
Chemotherapy, for breast cancer, 577–578
in malignant carcinoid syndrome, 559–563
and pheochromocytoma, 471–472
for prostate cancer, 580–583
for VIPomas, 549
and Zollinger-Ellison syndrome, 526, 534–536
Chloride, in hyperparathyroidism, 653
Chlorpromazine, for insulinoma, 71–72, 494
Chorionic gonadotropin, human, in insulinoma, 63
Chromaffin tumors, nomenclature of, 444–445
Chromatography, high performance liquid, in insulinoma, 63–64
Chromogranin A, in MEN-1 syndrome, 748
Collagen, 860–867
deposition in extracellular matrix, 865–867
gene transcription, 862–864
translation of mRNA into protein, 864–865
Colony stimulating factor, and hypercalcemia, 800–801
Coma, hypoglycemic, in hypothyroidism, 150
Computed tomography, in low-renin aldosteronism, 424–425
parathyroid localization, 666–672
cine, and three-dimensional modeling, 675–683
of pheochromocytoma, 455

quantitative, bone density measurement, 999–1001
for Zollinger-Ellison syndrome, 529
Congestive heart failure, and uremic hypoglycemia, 113–114
Converting enzyme inhibitors, in low-renin aldosteronism, 432
Corticosteroids, bone disease induced by, 947
and glucose homeostasis, 10–11
C-peptide, basal, in insulinoma, 60–61
in evaluation of hypoglycemia, 36
Cushing's syndrome, **311–338**
anatomic localization, 319–321
adrenal lesions, 320–321
pituitary lesions, 319–320
diagnostic evaluation, 316–319
drug therapy, 324–331
ACTH inhibition, 324–325
bromocriptine, 325
cyproheptadine, 324–325
sodium valproate, 325
adrenal inhibition, 325–331
aminoglutethimide, 325–326
ketoconazole, 327
metyrapone, 326
mitotane, 328–331
trilostane, 327–328
pathophysiology, 311–316
ACTH-independent, 315–316
ectopic ACTH syndrome, 313–315
pituitary ACTH-dependent, 312–313
treatment, 321–331
ACTH-independent, 331–332
adrenal surgery, 323–324
ectopic ACTH syndrome, 331
pituitary irradiation, 322–323
pituitary surgery, 321–322
Cyclic AMP, in hyperparathyroidism, 650–652
nephrogenous, marker for humoral hypercalcemia of malignancy, 781
Cyproheptadine, 324–325
Cytokines, in non–islet cell tumors, 98–99

Decorin, 876–880
Derived formative indices, histomorphometric analysis, 928
Diabetes, bone scanning, 987
histomorphometric analysis, 945
insulin-induced factitious hypoglycemia, 207–208
and pheochromocytoma, 460
Dialysis, hypercalcemia treatment, 821
hypoglycemia, 114–115
Diazoxide, 491
in insulinoma, 68
Diet, and hyperinsulinism, 490–491
in insulinoma, 67–68
Digital subtraction angiography, intravenous, 675
Dilantin, and hyperinsulinism, 492
for insulinoma, 68
Disopyramide, and hypoglycemia, 176
Diuretics, hypercalcemia treatment, 812–813
Dopamine, agonists, in acromegaly, 285, 291–295
in hyperprolactinemia, 264–265
in low-renin aldosteronism, 432
and pheochromocytoma, 449
and aldosterone secretion, 418–419
analogues, for glycoprotein hormone-secreting pituitary tumors, 344–347
Drugs, and hypoglycemia. See *Hypoglycemia, drug-induced.*
in infants and children, 226

EEG, in hypoglycemia, 31
EKG, in hypoglycemia, 31
Embryology of sympathomedullary chromaffin system, 443–444
Endocrine deficiencies, and hypoglycemia, **145–154**
Addison's disease, 149–150
adrenocorticotropic hormone deficiency, 148–149
anterior pituitary insufficiency, 145–146
diagnostic tests, 150–151
hypothyroidism, 150
treatment, 151–152
Endocrine tumors, medical therapy of, **259–390**
acromegaly, **277–310**
biochemical cure, 287
clinical picture, 281–283
differential diagnosis, 285
dopamine agonists, 291–295
epidemiology, 279–280
laboratory diagnosis, 283–285
natural course, 285–286
pathogenesis, 277–279
pathophysiology, 280–281
pharmacologic treatment, 290–291
radiation therapy, 289–290
somatostatin, 295–303
surgical treatment, 287–289
treatment, 286–287
aldosteronism, low-renin, **415–442**
clinical presentation and diagnosis, 422–426
medical treatment, 426–433
physiology and pathophysiology of aldosterone secretion, 415–422
breast and prostate cancer, **567–590**
breast cancer, 568–579

Endocrine tumors *(Continued)*
prostate cancer, 579–583
carcinoid syndrome, malignant, **555–566**
carcinoid crisis, 563–565
chemotherapy, 559–563
clinical features, 555–556
pathophysiology and diagnosis, 556–557
therapeutic considerations, 557–559
Cushing's syndrome, **311–338**
ACTH-independent Cushing's syndrome, 331–332
anatomic localization, 319–321
diagnostic evaluation, 316–319
ectopic ACTH syndrome, 331
pathophysiology, 311–316
treatment, 321–331
glycoprotein hormone–secreting pituitary tumors, **339–358**
diagnosis and characterization, 340–342
dopamine analogues, 344–347
etiology and pathogenesis, 340
GnRH analogues, 350–353
medical therapy, 343–344
somatostatin analogues, 347–350
treatment, 342–343
hypercalcemia, **389–414**
calcium homeostasis, 389
differential diagnosis, 389–402
general measures, 404–408
practical approach, 408–409
therapy, 404
hyperprolactinemia, **259–276**
clinical presentations, 261–262
investigation of, 262–263
management of prolactinoma, 266–270
without pituitary adenoma, 270–271
prolactin regulation, and etiology of, 259–261
therapeutic agents, 264–266
treatment, 263–264
pancreas, **483–516**
benign disease, 490–493
glucagonoma (hyperglycemic-cutaneous syndrome), 495–500
insulinoma, 486–490
malignant disease, 493–495
neurotensinomas, 507–509
pancreatic polypeptide, 504–507
somatostatinomas, 500–504
pheochromocytoma, **443–481**
clinical and biochemical characteristics, 450–454
embryology, anatomy, and physiology, 443–447
intraoperative management, 460–465
metastatic or inoperative lesions, 470–474
pharmacology of drugs affecting catecholamines, 447–450
postoperative management, 468–470
preoperative management, 458–460
surgical treatment, 465–468
tumor localization, 454–458
thyroid tumors, **359–387**
benign nodules, 359–362
malignant nodules or tumors, 362–381
VIPomas, **543–554**
clinical features, 543–544
pathophysiology, 544–546
treatment, 546–549
Zollinger-Ellison syndrome, **517–541**
clinical manifestations, 519–520
definition, 517
diagnosis and differential diagnosis, 520–522
etiology, 518
gastric acid hypersecretion, management of, 522–528
gastrinoma management, 529–537
incidence, 517–518
pathophysiology, 518
tumor pathology, 519
Enzymes, hepatic, in hypoglycemia, 83
Epinephrine, and glucose homeostasis, 9–10
Esophageal disease, and Zollinger-Ellison syndrome, 525–526
Estrogens, and hypercalcemia, 401–402
for primary hyperparathyroidism, 716–719
priming, and chemotherapy, in breast cancer, 577–578
Ethacrynic acid, for hypercalcemia, 812–813
Ethanol, and hypoglycemia, 168–169
in infants and children, 237
See also *Alcohol-induced hypoglycemia.*
Exercise and carbohydrate storage and intake, **155–161**
caloric intake, 158–160
exhaustion, 157–158
hormonal changes, 156–157
Exhaustion, and hypoglycemia, 157–158
Extracellular fluid volume, in hypercalcemia, 812
Extracellular matrix, collagen deposition, 865–867

Factitious hypoglycemia. See *Hypoglycemia, factitious.*
Familial benign (hypocalciuric) hypercalcemia, 402, **723–740**
clinical features, 724–728
calcium, urinary excretion, 726
genetics, 728
hypercalcemia, 724
magnesium, 725
in neonates and infants, 727–728
parathyroid hormone levels, 725–726
phosphorus, 725
symptoms, 726–727
history and definition, 723–724
identification and management, 736

pathogenesis, 728–734
bone density, histology, and turnover, 733
cellular pathogenesis, 733–734
parathyroid anatomy and function, 728–731
parathyroid hormone action, 731–732
renal tubular function, 732–733
vitamin D metabolism and calcium absorption, 733
research strategy, 736–738
treatment, 735–736
Family members, of patients with pheochromocytoma, 469–470
of patients with thyroid tumors, 377–378
screening in MEN-1 syndrome, 747–748
Fasting, prolonged (72-hour), in evaluation of hypoglycemia, 36–37
in insulinoma, 55–59
Fatty acid metabolism, in infants and children, 234–235
Fibroblast growth factors, 906–908
Fibronectin, 874–875
Floxuridine, 494
Floxuridine carmustine, 71
Fluorescence, in histomorphometric analysis, 939
Fluorouracil and streptozotocin, for insulinoma, 71
Follicular carcinoma. See *Thyroid tumors.*
Frequency versus time domain transformation, 925–926
Fructose-1,6–diphosphatase, 231–232
Fructose-1–phosphate aldolase, 233
Furosemide, hypercalcemia treatment, 812–813

Galactose-1-phosphate uridyl transferase, 233
Gallium nitrate, and hypercalcemia, 407–408, 823
Gastrectomy, in Zollinger-Ellison syndrome, 525, 527–528
Gastric acid hypersecretion. See *Zollinger-Ellison syndrome.*
Gastrinoma. See *Zollinger-Ellison syndrome.*
Gene transcription of collagen, 862–864
Genetic defects, and histomorphometric analysis of bone, 949
Genetics of familial benign (hypocalciuric) hypercalcemia, 728
Gla protein, 868–869
Glucagon, deficiency in infants and children, 227
and glucose homeostasis, 9
and hyperinsulinism, 492
for insulinoma, 69
tolerance test, 39
Glucagonoma (hyperglycemic-cutaneous syndrome), 495–500
clinical features, 495–497
skin rash, 496–497
diagnosis, 497–498
localization, 498–499
somatostatin therapy, 500
treatment, 499–500
Glucocorticoid-suppressible aldosteronism, 420–421, 426–427
Glucocorticoids, hypercalcemia treatment, 818–819
and hyperinsulinism, 492
for insulinoma, 69
and pheochromocytoma, 465
Gluconeogenesis, 4–7
Glucose, fasting plasma levels, in insulinoma, 52–54
homeostasis, in infants and children, 211–216
in liver disease, 77–79
hormonal control of homeostasis, 7–13
corticosteroids, 10–11
epinephrine and norepinephrine, 9–10
glucagon, 9
growth hormone, 11–13
insulin, 7–8
metabolism, in non–islet cell tumors, 92–94
oral tolerance test, 37–38
plasma levels in hypoglycemia, 33–34
reagent strip determinations, 205
suppression, in acromegaly, 284
tolerance test, in insulinoma, 62
utilization in fed and postabsorptive state, 1–2
Glucose-6-phosphatase, 228–231
Glycogen storage diseases, 228
Glycogenolysis, 3–4
Glycoprotein hormone–secreting pituitary tumors, 339–358
diagnosis and characterization, 340–342
etiology and pathogenesis, 340
medical therapy, 343–344
specific therapies, 344–353
dopamine analogues, 344–347
GnRH analogues, 350–353
somatostatin analogues, 347–350
treatment, 342–343
Glycoproteins, 869–876
alkaline phosphatase, 871–873
α_2-, in bone matrix, 885–886
fibronectin, 874–875
osteonectin, 869–871
thrombospondin, 875–876
Granulomatous diseases, vitamin D metabolite-mediated hypercalcemia, 755–758
Growth factors, in acromegaly, 279
of bone matrix, 883

Growth factors *(Continued)*
in skeletal remodeling, **903–918**
fibroblast growth factors, 906–908
genetic defects, 949
osteogenesis imperfecta, 949
osteopetrosis, 949
insulin-like growth factors, 908–910
osteoinductive factors, 912–913
platelet-derived growth factor, 905–906
transforming growth factor-β, 911–912
Growth hormone, in acromegaly, dynamic tests of secretion, 284–285
pituitary tumors, 277–278
ectopic secretion, 279
and insulin-like growth factor-I excess, 281–282
and glucose homeostasis, 11–13
Growth hormone–releasing hormone, and acromegaly, 278, 285, 302–303
analogues, in glycoprotein hormone–secreting pituitary tumors, 350–353

Heart disease, cyanotic congenital, 238
Heart failure, and pheochromocytoma, 459–460
Hepatic artery, embolization in Zollinger-Ellison syndrome, 536
ligation in malignant carcinoid syndrome, 561
Hereditary fructose intolerance, 233
Hip, bone mass and density measurement, 998–999
Histamine H_2-receptor antagonists, in Zollinger-Ellison syndrome, 523–524
Histomorphometric analysis of bone, **919–954**
aging processes in females and males, 939–940
bone remodeling, 920–923
indices of, 925–935
activation frequency, 930–931
bone balance calculation, 930
derived formative indices, 928
frequency vs. time domain transformation, 925–926
reconstruction of resorptive site, 929–930
remodeling curves, 931–935
three-dimensional structure thickness, 926–928
tissue level indices of turnover, 931
metabolic bone disease, 940–949
acromegaly, 945
corticosteroid-induced bone disease, 947
diabetes, 945
hepatic disorders, 949
hypercalciuria, idiopathic, 944
hyperparathyroid disorders, 941–944
medullary thyroid carcinoma, 945
obesity, 945
osteomalacia, 945–947
prostaglandin excess, 949
sex hormones, 947
thyroid disorders, 941
potential problems, 935–939
anisotropy of bone, 937
fluorescence measurements, 939
iliac crest bone samples, 935–936
number of intersections or intercepts, 936–937
resorption measurements, 937
static parameters (wall thickness and osteoid), 937–939
techniques, sampling methods, 924
Humoral hypercalcemia of malignancy, **779–794**
clinical features and diagnosis, 782–785
clinical findings, 782–784
biochemical features and differential diagnosis, 784–785
history, 779–780
parathyroid hormone–related protein, 785–791
in diagnosis and treatment, 790–791
isolation and cloning, 785–787
physiologic roles, 788–790
in vitro studies, 787–788
in vivo studies, 787
pathogenesis, 780–782
mechanism of hypercalcemia, 780
nephrogenous cyclic AMP as marker, 781
parathyroid hormone–vitamin D axis, 782
Hürthle cell tumors, 374
Hydroxyproline, in hyperparathyroidism, 653–654
Hypercalcemia, **389–414, 601–808**
calcium regulation in humans, **601–610**
calcium fluxes, 603–606
feedback loop diagram, 606–609
gastrointestinal absorption, 408
homeostasis, 389
stability of serum values, 601–603
clinical features, 402–404
differential diagnosis, 389–402
clinical forms, 392–393
evaluation and diagnosis, 393–394
and primary hyperparathyroidism, 390–396
surgery, 394–396
treatment, medical, 396
familial benign (hypocalciuric) hypercalcemia, **723–740**
clinical features, 724–728
clinical strategies, 736
history and definition, 723–724
pathogenetic mechanisms, 728–734

research strategy, 736–738
treatment, 735–736
humoral hypercalcemia of malignancy, 396–398, **779–784**
clinical features and diagnosis, 782–785
history, 779–780
parathyroid hormone-related protein, 785–791
pathogenesis, 780–782
hyperparathyroidism, primary. See *Hyperparathyroidism.*
idiopathic, histomorphometric analysis, 944
medication-induced, 401–402
multiple endocrine neoplasia syndromes, **741–752**
nonparathyroid causes, 749
type 1, 741–748
type 2 (2A), 748–749
type 3 (2B), 749
in nonparathyroid endocrine diseases, 399–400
other hypercalcemic factors, **795–806**
colony stimulating factor, 800–801
interleukin-1, 797–799
lymphotoxin, 800
prostaglandins, 802
transforming growth factor α, 795–799
transforming growth factor β, 97
tumor factors, 802–803
tumor necrosis factor, 799–800
parathyroid hormone measurement, 398–399, **611–629**
bioassay, 615–616
heterogeneity of blood PTH, 613–615
immunoassays, classification of, 617–618
two-site, noncompetitive, 619–620
interpretation, 623
mid-region vs. intact PTH in differential diagnosis of hypercalcemia, 621–623
radioimmunoassay, 616–619
synthesis and secretion, 611–613
parathyroid localization, **659–700**
anatomic and pathologic considerations, 661–663
cine computed tomography and three-dimensional modeling, 675–683
computed tomography, 666–672
interventional radiologic techniques, 693–697
intravenous digital subtraction angiography, 675
invasive procedures, 684–693
magnetic resonance imaging, 672–674
noninvasive techniques, 661
thallium-technetium subtraction scanning, 664–666
ultrasound, 663–664
surgery for, **701–714**
parathyroid localization, 706–707
pathology, 709–710
pathophysiology, 808–809
recognition and diagnosis, 702–705
treatment of, 404–408, **807–828**
bone resorption, inhibition of, 406–408
calcium absorption, 408
therapeutic measures, 809–824
unusual causes, **767–778**
mnemonic for differential diagnosis, 768–776
vitamin D metabolite–mediated, **753–766**
diagnosis, 761–762
endogenously synthesized, 755–760
exogenously administered, 760–761
normal synthesis, metabolism, and action of, 753–755
toxicity, 400–401
treatment and prevention, 762–763
Hypercortisolism, bone scanning, 987
Hyperinsulinism, in infants and children, 218–226
and insulinoma, diagnosis, 45–48
treatment, 67–71
Hyperparathyroidism, primary, **631–646, 647–658**
bone mass and density measurement, 1009
bone scanning, 979–980
clinical presentation and management, **631–646**
conservative management, 641–643
estrogens and progestins in management, **715–722**
histomorphometric analysis, 941–944
laboratory diagnosis, **647–658**
calcitriol levels, 653
chloride levels, 653
cyclic AMP, 650–652
dynamic tests, 652–653
hydroxyproline, 653–654
hypercalcemia identification, 647–648
immunoassays, 654–657
indirect tests, 649
phosphorus reabsorption, 649–650
radioimmunoassays, 654
and malignancy, 640
and nonmalignant deaths, 641
parathyroidectomy, 634–640
and bone disease, 638–640
complications of, 635–637
and hypercalcemia, 634–635
and neuromuscular symptoms, 637
and psychiatric symptoms, 637–638
radiology, 955–959
surgery for, **701–714**
parathyroid localization, 706–707
recognition and diagnosis, 702–705
indications for parathyroidectomy, 705

Hyperparathyroidism *(Continued)*
normocalcemia hyperparathyroidism, 704
surgical treatment, 707–709
vitamin D metabolite–mediated hypercalcemia, 759–760
See also *Hypercalcemia.*
Hyperprolactinemia, **259–276**
clinical presentations, 261–262
investigations of, 262–263
management of prolactinoma, 266–270
bromocriptine, and radiation therapy, 269
and surgery, 268–269
macroprolactinomas, 268
microprolactinomas, 266–268
during pregnancy, 269–270
prolactin regulation, and etiology of, 259–261
therapeutic agents, 264–266
bromocriptine analogs, 265
dopamine agonists, 264–265
other agents, 265–266
treatment, 263–264
without pituitary ademona, 270–271
Hypertension, and pheochromocytoma, 464, 469
Hyperthyroidism, bone mass and density, 1010
Hypervitaminosis A, bone scanning, 985
Hypoglycemia, **1–252**
artifactual, 203–206
analytical methods, 205
blood collection and storage, 203–204
whole blood confusion with plasma or serum values, 205–206
and autoimmunity syndromes, **123–143**
antireceptor antibodies, 123–132
autoimmune insulin syndrome, 132–139
blood, EKG, and EEG changes, 31
carbohydrate metabolism, **1–25**
counterregulation, during acute hypoglycemia, 13–17
during chronic hypoglycemia, 17–18
gluconeogenesis, 4–7
glucose utilization, 1–2
glycogenolysis, 3–4
hepatic glucose metabolism, 2–3
hormonal control of glucose homeostasis, 7–13
classification, 33
definition, 27
drug-induced, **163–183**
clinical factors, 163–167
disopyramide, 176
ethanol, 168–169
frequency, 167
instant diagnosis, 176–177
older drugs, 173–174
pentamidine, 175–176
phenformin, 173
propranolol, 173
quinine, 174–175
ritodrine and [kb]-2 agonists, 175–176
salicylates, 172–173
sulfonylurea compounds, 169–172
toxins, 176
treatment, 177–178
and endocrine deficiencies, **145–154**
Addison's disease, 149–150
adrenocorticotropic hormone deficiency, 148–149
anterior pituitary insufficiency, 145–146
diagnostic tests, 150–151
hypopituitarism, 146–148
hypothyroidism, 150
treatment, 151–152
exercise and carbohydrate storage and intake, **155–161**
caloric intake, 158–160
exhaustion, 157–158
hormonal changes, 156–157
factitious, 206–209
blood glucose determinations, 208–209
diagnosis, 206–207
insulin-induced, 207–208
sulfonylurea-induced, 208
glucose levels, and hormonal response, 31–33
in infants and children, **211–252**
diagnostic evaluation, 242–245
glucose homeostasis, 211–216
hormone secretion abnormalities, 218–227
metabolic fuels, production and utilization, 228–238
signs and symptoms, 217–218
substrate availability, 238–242
insulin-producing islet cell tumors, **45–74**
diagnosis and differential diagnosis, 45–48
insulinoma, 48–52
laboratory evaluation, 52–64
localization, and diffuse hyperinsulinism, 64–67
treatment, 67–71
and liver disease and ethanol, **75–90**
clinical assessment, 76–77
glucose homeostasis, 77–79
non–islet cell tumors, **91–101**
clinical features, 91–92
cytokines, 98–99
glucose metabolic abnormalities, 92–94
insulin and insulin cross-reactive peptides, 94–95
malnutrition, 94
non-suppressible insulin-like activity, 95–98
and pheochromocytoma, 468
physical findings, 30–31
reactive, **185–202**

and renal failure, **103–121**
acute renal failure, 115–116
clinical features, 103–105
dialysis hypoglycemia, 114–115
secondary uremic hypoglycemia, 109–114
spontaneous hypoglycemia, 105–109
symptoms of, 28–30
adrenergic, 28–29
neuroglycopenic, 29–30
tests for evaluation, **33–40**
C-peptide, 36
calcium infusion, 39–40
fast, prolonged (72-hour), 36–37
glucagon tolerance, 39
glucose, 33–34
insulin, 35
leucine tolerance, 39
oral glucose tolerance, 37–38
proinsulin, 36
tolbutamide tolerance, 38–39
Hypopituitarism, 146–148
Hypothalamic tumors, and acromegaly, 278
Hypothyroidism, 150
in infants and children, 227

Iliac crest bone sampling, 935–936
Imaging procedures, for pheochromocytoma, 456–458
for Zollinger-Ellison syndrome, 529
Immobilization hypercalcemia, 402, 770–771, 821
Immunoassays of parathyroid hormone, 617–618
second generation, 654–657
two-site noncompetetive, 619–620
Inborn errors of metabolism, 228–235
amino acid metabolism, 233–234
carbohydrate metabolism, 228–233
glycogen storage diseases, 228
hepatic gluconeogenesis, 228–231
fructose-1,6-diphosphatase deficiency, 231–232
fructose-1-phosphate aldolase, 233
galactose-1-phosphate uridyl transferase, 233
glucose-6-phosphatase deficiency, 228–231
phosphoenolpyruvate carboxykinase, 232–233
pyruvate carboxylase, 232–233
fatty acid metabolism, 234–235
Infants and children, hypoglycemia in, **211–252**
diagnostic evaluation, 242–245
glucose homeostasis, 211–216
acquired or transient defects, 235–238
cyanotic congenital heart disease, 238
ethyl alcohol, 237
Reye's syndrome, 236–237
salicylates, 237–238
in small for gestational age infant, 235–236
hormone secretion abnormalities, 218–227
glucagon deficiency, 227
hyperinsulinemia, 218–226
drug-induced, 226
sustained, 222–226
transient neonatal, 219–222
pituitary, thyroid, and adrenal insufficiency, 227
inborn errors of metabolism, 228–235
amino acid metabolic defects, 233–234
carbohydrate metabolism, 228–233
glycogen storage diseases, 228
hepatic gluconeogenesis, 228–231
fatty acid metabolism, 234–235
ketotic hypoglycemia, 238–241
signs and symptoms, 217–218
surgery-associated, 241–242
Infections, bacterial and parasitic, and uremic hypoglycemia, 114
Inflammatory diseases, and hypercalcemia, 773
Insulin, and cross-reactive peptides, in non–islet cell tumors, 94–95
in evaluation of hypoglycemia, 35
and factitious hypoglycemia, 207–208
and glucose homeostasis, 7–8
immunoreactive, after prolonged fasting, 55–57
and uremic hypoglycemia, 109
See also *Autoimmunity syndromes, and hypoglycemia.*
Insulin-like growth factors, 908–910
in acromegaly, 281–282, 284
Insulin-producing islet cell tumors, **45–74**
arteriography, 64–65
diagnosis and differential diagnosis, 45–48
hormone secretion, 62–63
insulinoma, 48–52
laboratory evaluation, 52–64
C-peptide, basal, 60–61
fasting plasma glucose, 52–54
glucose tolerance, 62
high performance liquid chromatography, 63–64
human chorionic gonadotropin and subunits, 63
multiple endocrine neoplasia–type I, 63
plasma immunoreactive insulin after prolonged fasting, 55–57
proinsulin, basal, 60
provocative test, 61
ratio of plasma immunoreactive insulin to glucose, 58–59
secretin test, 62
suppressor test, 61

Insulin-producing islet cell tumors *(Continued)*
tolbutamide tests, 61–62
localization, and diffuse hyperinsulinism, 64–67
arteriography, 64–65
CAT and NMR imaging, 65
transhepatic percutaneous venous sampling, 65–66
ultrasonography, 65, 66
treatment, 67–71
benign disease, 67–69
malignant disease, 69–70
Insulinoma, 486–490
diagnosis, 486–488
islet B-cell disease with hyperinsulinism, 489–490
localization, 488–489
Interferon therapy, in Zollinger-Ellison syndrome, 536–537
Interleukin-1, and hypercalcemia, 797–799
Irradiation, in Cushing's syndrome, 322–323
Islet cell tumors, and hypercalcemia, 400

Ketoconazole, 327
Ketotic hypoglycemia, 238–241
Kidney failure, in familial benign (hypocalciuric) hypercalcemia, 732–733
and hypoglycemia, **103–121**
acute renal failure, 115–116
clinical features, 103–105
dialysis hypoglycemia, 114–115
secondary uremic hypoglycemia, 109–114
bacterial and parasitic infections, 114
congestive heart failure, 113–114
hepatic dysfunction, 113
iatrogenic, 109–113
and other hypoglycemic conditions, 113
spontaneous hypoglycemia, 105–109

Leucine tolerance test, 39
Lithium carbonate, and hypercalcemia, 401
Liver, dysfunction of, histomorphometric analysis of bone, 949
and hypoglycemia, **75–90**
clinical assessment, 76–77
drug-related, 83–84
enzyme deficits, 83
glucose homeostasis, 77–79
hormone deficiency states, 82–83
structural incompetence, 79–82
and uremic hypoglycemia, 113
glucose metabolism, postabsorptive and postprandial, 2–3
Luteinizing hormone–releasing hormone superagonists, and breast cancer, 571
Lymphomas of thyroid. See *Thyroid tumors.*
Lymphoproliferative diseases, hypercalcemia in, 758–759
Lymphotoxin, and hypercalcemia, 800

Macroprolactinomas, 268
Magnesium, in familial benign (hypocalciuric) hypercalcemia, 725
Magnetic resonance imaging, of insulinoma, 65
in low-renin aldosteronism, 425
parathyroid localization, 672–674
of pheochromocytoma, 455–456
for Zollinger-Ellison syndrome, 530
Malignancy, and hypercalcemia, 396–399
in hyperparathyroidism, 640
See also Humoral hypercalcemia of malignancy.
Malnutrition, in non–islet cell tumors, 94
Maple syrup urine disease, 233–234
Matrix Gla protein, 868–869
Medullary thyroid carcinoma, histomorphometric analysis, 945
See also *Thyroid tumors.*
Metabolic bone disease, **833–1012**
biochemistry of bone, **859–902**
mineralized bone matrix, 859–886
organic phase and biologically controlled mineralization, 886–888
bone cell physiology, **833–858**
bone formation and resorption, 834–835
coupling of bone formation and resorption, 847–849
hormones and local factors in regulation of bone resorption, 835–838
humoral and local factors, 838–846
bone mass and density measurements, **995–1012**
bone loss measurement by repeated measurements, 1001–1004
clinically useful techniques, 995–1001
mineral measurements, 1004–1010
bone scanning, **979–993**
acromegaly, 985–987
diabetes, 987
hypercortisolism, 987
hyperparathyroidism, 979–980
hypervitaminosis A, 985
osteomalacia, 984–985
Paget's disease, 987–991
quantitation of, 991
renal disease, 980–984
thyroid disease, 985
whole body retention measurements, 991
growth factors in skeletal remodeling, **903–918**

fibroblast growth factors, 906–908
insulin-like growth factors, 908–910
osteoinductive factors, 912–913
platelet-derived growth factor, 905–906
transforming growth factor-β, 911–912
histomorphometric analysis of bone, **919–954**
bone diseases, 940–949
bone remodeling, 920–923
genetic defects, 949
histomorphometric techniques, 923–924
indices of, 925–935
physiological aging processes, 939–940
potential problems, 935–939
radiology, **955–976**
hyperparathyroidism, 955–959
osteomalacia and rickets, 960–963
Paget's disease, 968–975
renal osteodystrophy, 963–966
steroid-related bone disease, 966–968
thyroid-related bone disease, 959–960
Metaiodobenzylguanidine, and pheochromocytoma, 456, 473–474
α-Methylparatyrosine, and pheochromocytoma, 459
Metyrapone, 326
Microprolactinomas, 266–268
Milk-alkali syndrome, 401, 771–773
Minerals, bone measurement of, 1004–1010
Mithramycin (Plicamycin), and hypercalcemia, 406, 813
for insulinoma, 71
for malignant insulinoma, 494
Mitomycin-C, 71, 494
Mitotane, 328–331
Mnemonic for differential diagnosis of hypercalcemia, 768–776
Multiple endocrine neoplasia (MEN) syndromes, **741–752**
nonparathyroid causes, 749
type 1, 148, 741–748
chromogranin A, 748
clinical presentation, 741–743
etiology, 744–745
family screening, 747–748
parathyroidectomy, 745–747
in vitro studies, 743–744
type 2 (2A), 748–749
clinical presentation, 748–749
surgical guidelines, 749
type 3 (2B), 749
Muscle relaxation, and pheochromocytoma, 462
Musculoskeletal changes, in acromegaly, 281
multiple endocrine, type I, 63
Neuromuscular symptoms, parathyroidectomy effects, 637
Neuropathy, peripheral, in acromegaly, 281–282
Neurotensinomas, 507–509
Nitroprusside, and pheochromocytoma, 463
Non–islet cell tumors, **91–101**
clinical features, 91–92
glucose metabolic abnormalities, 92–94
insulin and insulin cross-reactive peptides, 94–95
malnutrition role, 94
non-suppressible insulin-like activity, 95–98
tumor-induced cytokines, 98–99
Non-suppressible insulin-like activity (NSILA), 95–98
Norepinephrine, and glucose homeostasis, 9–10

Obesity, histomorphometric analysis, 945
Omeprazole, in Zollinger-Ellison syndrome, 524–525
Osteoblasts, 838–842
bone matrix components synthesized by, 860–884
differentiation, 840–842
circulating hormones, 841
local factors, 841–842
proliferation, 839–840
circulating hormones, 839–840
local factors, 840
Osteocalcin, 867–868
Osteoclasts, 842–846
bone marrow culture, 844–846
formation, 843–844
bone matrix synthesis, 885
Osteogenesis imperfecta, 949
Osteogenin, 883–884
Osteoid, in histomorphometric analysis, 937–939
Osteoinductive factors, 883–884, 912–913
Osteomalacia, bone scanning, 984–985
histomorphometric analysis, 945–947
radiology, 960–963
Osteonectin, 869–871
Osteopenia, corticosteroid-induced, bone mass and density, 1008
Osteopetrosis, 949
Osteopontin, 880–882

Neonates and infants, familial benign (hypocalciuric) hypercalcemia, 727–728
Neoplastic disease, and hypercalcemia, 773
Paget's disease, bone scanning, 987–991
and hypercalcemia, 775–776
radiology, 968–975
Pancreatic endocrine tumors, **483–516**

Pancreatic endocrine tumors *(Continued)*
benign disease, 490–493
medical management, 490–492
calcium channel blockers, 491
diazoxide and natriuretic benzothiadiazines, 491
diet, 490–491
dilantin, 492
glucagon, 492
glucocorticoids, 492
propranolol, 491–492
somatostatin analogue, 492
surgical management, 492–493
glucagonoma (hyperglycemic-cutaneous syndrome), 495–500
clinical features, 495–497
diagnosis, 497–498
localization, 498–499
skin rash, 496–497
somatostatin therapy, 500
treatment, 499–500
insulinoma, 486–490
diagnosis, 486–488
islet B-cell disease, 489–490
localization, 488–489
malignant disease, 493–495
medical management, 493–495
adriamycin, 494
asparaginase, 494
chlorpromazine, 494
floxuridine, carmustine, and mitomycin-C, 494
mithramycin, 494
propranolol, 494
somatostatin, 494
streptozotocin, 493–494
plus fluorouracil, 494
surgical management, 493
neurotensinomas, 507–509
pancreatic polypeptide, 504–507
diagnosis, 504–507
treatment, 507
somatostatinomas, 500–504
Pancreatic polypeptide, 504–507
Papillary or papillary-follicular carcinoma. See *Thyroid tumors.*
Parathyroid gland localization, **659–700**
anatomic and pathologic considerations, 661–663
invasive procedures, 684–693
arteriography, 688–689
autotransplantation techniques, 692–693
carcinoma localization, 692
venous catheterization, 689–692
noninvasive techniques, 661
cine CT and three-dimensional modeling, 675–683
comparison studies, 684
computed tomography, 666–672
intravenous digital subtraction angiography, 675
magnetic resonance imaging, 672–674
thallium-technetium subtraction scanning, 664–666
ultrasound, 663–664
radiology, interventional techniques, 693–697
Parathyroid hormone measurement, **611–629**
bioassay, 615–616
in familial benign (hypocalciuric) hypercalcemia, 725–726
heterogeneity of blood PTH, 613–615
in hypercalcemia, 769
immunoassay, classification of, 617–618
two-site, noncompetetive, 619–620
interpretation of, 623
mid-region vs. intact PTH in differential diagnosis of
hypercalcemia, 621–623
radioimmunoassay, 616–617
clinical utility of, 618–619
synthesis and secretion, 611–613
Parathyroid hormone–related peptide, 398–399
See also Humoral hypercalcemia of malignancy.
Parathyroidectomy, indications for, 705
in MEN-1 syndrome, 745–747
in Zollinger-Ellison syndrome, 527
See also Hyperparathyroidism, primary.
Parietal cell vagotomy, in Zollinger-Ellison syndrome, 527
Pelvic pheochromocytoma, 467
Pentamidine, 175–176
Phenformin, 173
Pheochromocytoma, **443–481**
anatomy, 444
clinical and biochemical characteristics, 450–454
biochemical diagnosis, 452–454
course and prognosis, 451–452
differential diagnosis, 454
incidence and associations, 450
suppressive and provocative tests, 454
symptoms and signs, 450–451
embryology, 443–444
and hypercalcemia, 400
management, intraoperative, 460–465
adrenergic blockade, 463
anesthesia, 460–461
antiarrhythmic drugs, 463
fluid replacement, 464
glucocorticoid replacement, 465
hypertensive and hypotensive crises, 464
induction and intubation, 462
inhalation anesthesia, 462–463
monitoring, 461–462
muscle relaxation, 462
nitroprusside, 463

premedication, 461
regional anesthesia, 464–465
team concept, 460
postoperative, 468–470
biochemical tests, 468–469
cardiovascular monitoring, 468
follow-up, 469
hypertension, residual, 469
hypoglycemia, 468
screening of family members, 469–470
volume status, 468
preoperative, 458–460
α-adrenergic blockade, 458–459
β-adrenergic blockade, 459
antiarrhythmic drugs, 459
diabetes, 460
heart failure, 459–460
α-methylparatyrosine, 459
transfusions, 460
volume repletion, 460
metastatic or inoperative lesions, 470–474
chemotherapy, 471–472
definitions, 470–471
pharmacology, 471
radioiodine MIBG therapy, 473–474
teleradiotherapy, external beam, 473
tumor embolization, 472–473
nomenclature of chromaffin tumors, 444–445
pharmacology of agonists, antagonists, and drugs affecting catecholamines, 447–450
physiology, 445–447
surgical therapy, 465–468
abdominal, 465–466
cervical, 467
metastatic disease, 468
pelvic, 467
during pregnancy, 466–467
thoracic, 467
tumor localization, 454–458
computed tomography, 455
imaging procedures, 456–458
magnetic resonance imaging, 455–456
nuclear medicine techniques, 456
Phosphates, oral and intravenous, hypercalcemia treatment, 819–820
Phosphoenolpyruvate carboxykinase, 232–233
Phosphoproteins, of bone, 880–882
Phosphorus, in familial benign (hypocalciuric) hypercalcemia, 725
in hypercalcemia, 768–769
reabsorption tests, in hyperparathyroidism, 649–650
Pituitary, ACTH-dependent Cushing's syndrome, 312–313
adenoma, lack of in hyperprolactinemia, 270–271
in Cushing's syndrome, anatomy of lesions, 319–320
irradiation, 322–323
surgery, 321–322
glycoprotein hormone-secreting tumors. See *Glycoprotein hormone–secreting pituitary tumors.*
growth hormone–producing tumors, 277–278
GH hypersecretion, 278–279
and hypoglycemia, 145–146
in infants and children, 227
tumor, mass effects in acromegaly, 282
Pituitary factor, and aldosterone secretion, 417–418
Platelet-derived growth factor, 905–906
Plicamycin, hypercalcemia treatment, 813
Potassium, and aldosterone secretion, 417
Pregnancy, pheochromocytoma during, 466–467
and prolactinomas, 269–270
Progestins, for breast cancer, 577
for primary hyperparathyroidism, 719–721
Proinsulin, basal, in insulinoma, 60
in evaluation of hypoglycemia, 36
Prolactin regulation of secretion, 259–261
Prolactinoma. See *Hyperprolactinemia.*
Propranolol, for hyperinsulinism, 491–492, 494
and hypoglycemia, 173
for insulinoma, 68, 71
Prostaglandins, inhibitors and hypercalcemia, 407
and histomorphometric analysis of bone, 949
and hypercalcemia, 802, 821
Prostate cancer, 579–583
androgens, blockade, 580
priming and chemotherapy, 580–583
conventional treatment, 579–580
Proteoglycans, of bone, 876–880
Proton beam irradiation, in acromegaly, 290
Psychiatric symptoms, parathyroidectomy effects, 637–638
Pyruvate carboxylase, 232–233

Quinine, 174–175

Radiation therapy, for acromegaly, 289–290
of prolactinomas, 269
Radioimmunoassays of parathyroid hormone, 616–617
clinical utility of, 618–619
first generation, 654
Radioiodine treatment of thyroid tumors, 367–370

Radiology, of metabolic bone disease, 955–976
hyperparathyroidism, 955–959
osteomalacia and rickets, 960–963
Paget's disease, 968–975
renal osteodystrophy, 963–966
steroid-related bone disease, 966–968
thyroid-related bone disease, 959–960
of parathyroid, interventional techniques, 693–697
Remodeling, bone, histomorphometric analysis, 920–923
bone loss mechanisms, 922–923
curve construction, 931–935
skeletal. See *Growth factors, in skeletal remodeling.*
Renal disease, bone scanning, 980–984
osteodystrophy, bone mass and density, 1009–1010
radiology, 963–966
Renin-angiotensin system, and aldosterone secretion, 416
Resorption of bone, coupling with bone formation, 846–849
histomorphometric analysis, site reconstruction, 929–930
measurement problems, 937
hormones and local factors, 835–838
inhibitors of resorption, 838
resorbing agents, 836–837
physiology of, 834–835
Reye's syndrome, 236–237
Rhabdomyolysis, and hypercalcemia, 775
Rickets, 960–963
Ritodrine, 175–176

Salicylates, and hypoglycemia, 172–173
in infants and children, 237–238
and uremic hypoglycemia, 113
Sandostatin. See *Somatostatin.*
Sarcoidosis, and hypercalcemia, 773
vitamin D metabolite–mediated hypercalcemia, 755–757
Scintigraphy, adrenal iodocholesterol, 425
of pheochromocytoma, 456
of thyroid tumors, 366–367
Secretin test in insulinoma, 62
Serotonin, and aldosterone secretion, 418
antagonists, in low-renin aldosteronism, 432
Sex differences, physiological aging processes in bone, 939–940
Sex hormones, and histomorphometric analysis of bone, 947
Sialoproteins, of bone, 880–882
Skeleton, appendicular bone mass and density, 995–998
Skin rash, in glucagonoma, 496–497
SMS 201–995. See *Somatostatin.*
Sodium transport inhibitors, in low-renin aldosteronism, 430–431
Somatostatin, for acromegaly, 295–303
chronic treatment, 296–297
clinical response, 299
continuous infusion, 301
dynamic GH response, 299
and other endocrine functions, 299–300
pharmacology, 296
and pituitary tumor size, 300–301
side effects, 301–302
suppression of GH hypersecretion, 298–299
unresponsiveness to, 301
and aldosterone secretion, 419
analogue, for breast cancer, 578–579
for glycoprotein hormone-secreting pituitary tumors, 347–350
and hyperinsulinism, 492
for insulinoma, 68–70
for malignant carcinoid syndrome, 561–563
for malignant insulinoma, 494
Somatostatinomas, 500–504
Spine bone mass and density measurement, 998–999
Spironolactone, in low-renin aldosteronism, 429–430
Steroid-related bone disease, 966–968
Steroidogenesis inhibitors, in low-renin aldosteronism, 432–433
Streptozotocin, for insulinoma, 71, 493–494
plus fluorouracil, 494
Structure, three-dimensional thickness, 926–928
Sulfonylureas, and factitious hypoglycemia, 208
and hypoglycemia, 169–172
and uremic hypoglycemia, 110–111
Surgery, for acromegaly, 287–289
in Cushing's syndrome, 321–322
adrenal, 323–324
for hypercalcemia, 394–396
for hyperinsulinism, 492–493
and hypoglycemia, 241–242
for insulinoma, 69–70
for pheochromocytoma, 465–468
for primary hyperparathyroidism. *See* Hyperparathyroidism, primary.
of prolactinomas, 268–269
of thyroid tumors, 364–366
for VIPomas, 548–549
and Zollinger-Ellison syndrome, 526–528

Teleradiotherapy, external beam, of pheochromocytoma, 473
Thiazides, and hypercalcemia, 401, 773–775

Thoracic pheochromocytoma, 467
Thrombospondin, 875–876
Thyroid disease, bone scanning, 985
  deficiency, 150
    in infants and children,227
  histomorphometric analysis, 941
  radiology in bone disease, 959–960
Thyroid tumors, **359–387**
  benign nodules, 359–362
    functioning and hyperfunctioning, 361–362
    hypofunctioning, cystic, 361
    solid and mostly solid, 359–360
  hypercalcemia, **389–414**
    clinical features, 402–404
  malignant nodules or tumors, 362–381
    anaplastic, 380–381
    follicular carcinoma, 372–374
    Hürthle cell tumors, 374
    lymphomas, 378–380
      definition and demography, 378–379
      diagnosis, 379
      treatment and follow-up, 379
    medullary carcinoma, 374–378
      basic nature, 375
      diagnosis, 375–376
      family members, 377–378
      treatment and follow-up, 376–377
    papillary or papillary-follicular carcinoma, 362–372
      follow-up evaluation, 370–371
      preoperative evaluation, 366–367
      prevalence, classification, and risks, 362–364
      radioiodine treatment, 367–370
      surgery, 364–366
      thyroid hormone treatment, 370
Thyrotoxicosis, and hypercalcemia, 771
Thyrotropin-releasing hormone, in acromegaly, 285
Tissue level indices of turnover, 931
Tolbutamide, tolerance test, 38–39, 61–62
Tomography, computed axial (CAT), of insulinoma, 65
Toxins, hypoglycemic, 176
Transforming growth factor α, 795–797
Transforming growth factor β, 797, 911–912
Transfusions, and pheochromocytoma, 460
Transhepatic percutaneous venous sampling, 65–66
Transplantation, auto, of parathyroid, 692–693
Trilostane, 327–328
Tuberculosis, vitamin D metabolite–mediated hypercalcemia, 757
Tumor necrosis factor, and hypercalcemia, 799–800

Ultrasonography, of insulinoma, 65, 66
  parathyroid localization, 663–664
  for Zollinger-Ellison syndrome, 529

Valproate, in Cushing's syndrome, 325
Venous sampling, adrenal, 425
  in Zollinger-Ellison syndrome, 530
VIPomas, **543–554**
  clinical features, 543–544
  pathophysiology, 544–546
  surgery, 548–549
  treatment, 546–549
    chemotherapy, 549
    pharmacotherapy, 547–548
    practical management, 549
    supportive therapy, 546
Vitamin A toxicity, and hypercalcemia, 402, 769–770
Vitamin D metabolite–mediated hypercalcemia, 400–401, **753–766**
  diagnosis, 761–762
  endogenously synthesized metabolites, 755–760
    granulomatous diseases, 755–758
      other granuloma-forming diseases, 757–758
      sarcoidosis, 755–757
      tuberculosis, 757
    lymphoproliferative diseases, 758–759
    primary hyperparathyroidism, 759–760
  exogenously administered metabolites, 760–761
  familial benign (hypocalciuric) hypercalcemia, 733
  humoral hypercalcemia of malignancy, 782
  normal synthesis, metabolism, and action of vitamin D and metabolites, 753–755
  treatment and prevention, 762–763
Volume, intravascular, and pheochromocytoma, 460, 468

Wall thickness, histomorphometric analysis, 937–939
WR-2721, hypercalcemia treatment, 407, 821–822

Zollinger-Ellison syndrome, **517–541**
  clinical manifestations, 519–520
  definition, 517
  diagnosis and differential diagnosis, 520–522
  etiology, 518
  gastric acid hypersecretion, 522–528

Zollinger-Ellison syndrome *(Continued)*
medical management, 522–526
acute emergency, 522
and chemotherapy, 526
with esophageal disease, 525–526
long-term, 523–525
and previous Billroth II gastrectomy, 525
and surgery, 526
surgical management, 526–528
parathyroidectomy, 527
parietal cell vagotomy, 527
total gastrectomy, 527–528
gastrinoma management, 529–537
treatment, 530–537
metastatic, 534–537
nonmetastatic, 531–534
tumor localization, 529–530
incidence, 517–518
pathophysiology, 518
tumor pathology, 519